Human Mobility in Mountain Areas in a Changing Climate

POLICY BRIEF

IOM UN MIGRATION

Food and Agriculture Organization of the United Nations

Mountain Partnership

©Ashley Felt

SHOUT
SHARE
IT

Human Mobility in Mountain Areas in a Changing Climate

Cover picture: Grigorievka, Kyrgyzstan.
© Mikhail Blinov, 2024, on Unsplash.

Table of Contents

Executive summary 3

1. Climate change impacts in mountain areas 4
   - 1.1 Key data on mountain areas 4
   - 1.2 Impacts of climate change 6
2. Human mobility patterns in climate change contexts 8
3. Initial evidence from Ecuador, Kyrgyzstan and Tajikistan 11
4. A future agenda: leveraging policies and opportunities 17

References 18

List of Figures

Figure 1: Global mountain areas as per the UNEP-WCMC classification 4

Figure 2: Share of mountain areas in the different classes (Romeo et al., 2020) 5

Figure 3: Mountain population density and distribution in 2020 6

Figure 4: Types of environmental and climatic hazard faced by people in past 5 years, Kyrgyzstan 12

Figure 5: Types of environmental and climatic hazard faced by people in past 5 years, Tajikistan 12

Figure 6: Types of environmental and climatic hazard faced by people in past 5 years, Ecuador 13

List of Boxes

Box 1: Mountain definition 5

Box 2: The link between climate change and human mobility 7

Executive summary

Mountain areas are severely affected by the impacts of climate change, both in terms of sudden-onset hazards and slow-onset degradation processes. These adverse impacts influence human mobility in multiple and complex ways in interaction with social, economic, political, demographic and environmental contexts.

The effects of climate change on human mobility in mountain areas have received relatively limited attention from researchers and policymakers. However, the available evidence points to the gravity of the impacts that mountain societies face due to climate change and the multiple dimensions of human mobility in terms of disaster displacement, planned evacuation, pastoralism, labour migration and planned relocation.

The International Organization for Migration (IOM) and the Mountain Partnership have partnered to put into perspective important dimensions of climate mobility in mountain areas, based on a review of available documents and the baseline findings from an innovative longitudinal study led by IOM in Ecuador, Kyrgyzstan and Tajikistan.

Preliminary results show the multiple impacts of climate hazards on the vulnerable livelihoods of mountain societies and diverse responses in terms of human mobility, ranging from evacuations and displacement to pastoralism and labour migration to immobility and place attachment. In turn, this requires innovative solutions, some of which are suggested at the end of this document.

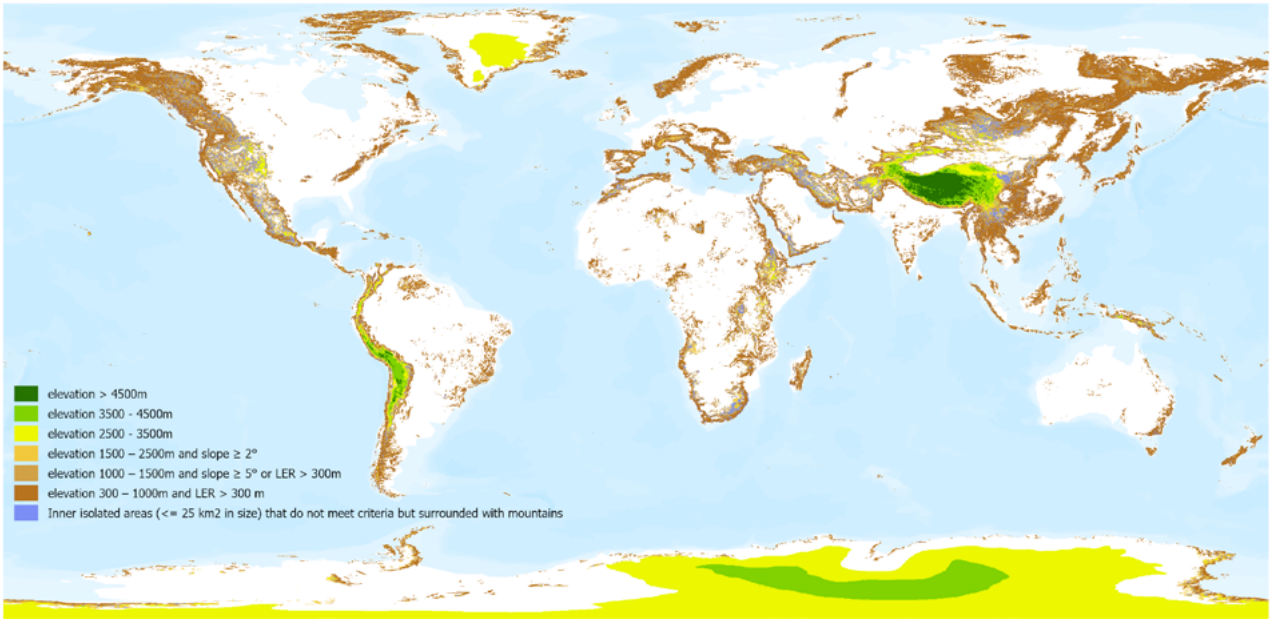
1. Climate change impacts in mountain areas

1.1 Key data on mountain areas

Mountains, covering approximately 27 percent of the Earth's land surface, offer essential resources such as water, food, biodiversity and energy crucial for humanity's sustenance. In 2017, they hosted 1.1 billion members of the Earth's population – 15 percent of the total (Romeo *et al.*, 2020).

However, these ecosystems are vulnerable to several challenges, including rising temperatures, changes in precipitation, extreme weather events and unsustainable resource utilization. Particularly in rural areas of developing countries, mountain communities face significant socioeconomic hardships, marked by poverty, food insecurity and inadequate access to infrastructure and services. Despite a growing global mountain population, which reached nearly 1.1 billion in 2017, higher altitudes above 3 500 metres experienced depopulation trends over the period between 2000 and 2017 (Romeo *et al.*, 2020). In many cases, urbanization in mountain areas has brought with it mounting pressure on infrastructure, water and services for city dwellers, while the impacts of climate change have reduced water availability and energy provision (Adler *et al.*, 2022).

Figure 1: Global mountain areas as per the UNEP-WCMC classification


elevation > 4500m
elevation 3500 - 4500m
elevation 2500 - 3500m
elevation 1500 – 2500m and slope ≥ 2°
elevation 1000 – 1500m and slope ≥ 5° or LER > 300m
elevation 300 – 1000m and LER > 300 m
Inner isolated areas (<= 25 km2 in size) that do not meet criteria but surrounded with mountains

Notes: The boundaries and names shown and the designations used on these map(s) do not imply the expression of any opinion whatsoever on the part of FAO and IOM concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers and boundaries.

Source: Author's own elaboration.

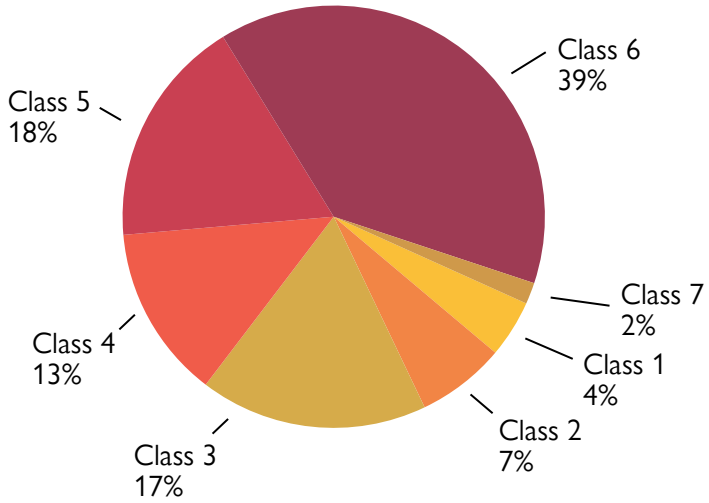
BOX 1: MOUNTAIN DEFINITION

This study uses the latest United Nations Environment Programme–World Conservation Monitoring Centre (UNEP–WCMC) definition of mountains, which identifies seven classes:

- **Class 1**. elevation > 4 500 m
- **Class 2**. elevation 3 500 – 4 500 m
- **Class 3**. elevation 2 500 – 3 500 m
- **Class 4**. elevation 1 500 – 2 500 m and slope ≥ 2°
- **Class 5**. elevation 1 000 – 1 500 m and slope ≥ 5° or local elevation range [7 km radius] > 300 m
- **Class 6**. elevation 300 – 1 000 m and local elevation range [7 km radius] > 300 m
- **Class 7**. isolated inner basins and plateaus less than 25 km2 in extent that are surrounded by mountains but do not themselves meet the criteria of classes 1–6 (this seventh class was introduced in the 2002 revision of the original 2000 system).

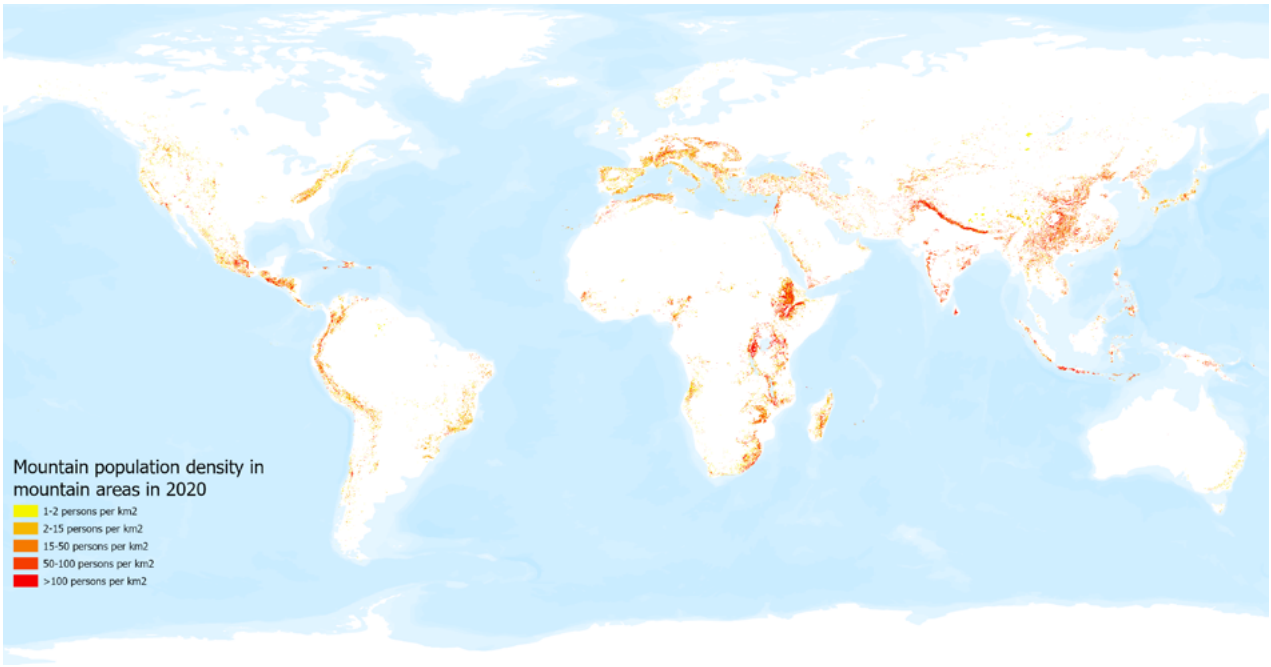
Source: Blyth *et al.*, 2002. *Mountain watch: Environmental change and sustainable development in mountains*. UNEP WCMC. https://lib.icimod.org/record/11058.

Figure 2: Share of mountain areas in the different classes (Romeo *et al.*, 2020)



Song-Kul, Kyrgyzstan.
© Oziel Gómez, 2017,
on Unsplash.

Figure 3: Mountain population density and distribution in 2020


Mountain population density in mountain areas in 2020
1-2 persons per km2
2-15 persons per km2
15-50 persons per km2
50-100 persons per km2
>100 persons per km2

Notes: The boundaries and names shown and the designations used on these map(s) do not imply the expression of any opinion whatsoever on the part of FAO and IOM concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers and boundaries.

Source: Author's own elaboration.

1.2 Impacts of climate change

Following the 2019 Special report on the ocean and cryosphere in a changing climate (Hock *et al.*, 2019), the Working Group II Report of the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) dedicated an entire chapter to mountains, highlighting their vulnerability to the effects of climate change and the key role that they play in combating climate change and achieving sustainable development globally.

Specifically, the Mountain Chapter in the Working Group II Report of the Sixth Assessment of the IPCC (Adler *et al.*, 2022) highlights that:

- Climate change effects in mountainous regions and their attribution to human activity have escalated in recent decades, leading to observable and significant consequences for both people and ecosystems within these areas.
- The alteration in climate and cryosphere has detrimentally affected the water cycle within mountainous areas, causing fluctuations in the timing of glacier and snowmelt stream discharge. These alterations have diverse repercussions on water accessibility for communities and economies, amplifying tensions or conflicts over water resources, particularly in seasonally dry regions.
- Climate-induced hazards, such as flash floods and landslides, have contributed to a surge in disasters impacting an increasing number of people living in mountain-adjacent downstream areas.

The 28th Conference of Parties (COP) of the United Nations Framework

Convention on Climate Change (UNFCCC) in 2023 underscored the significance of mountains in sustainable development, highlighting their vulnerability and the importance of protection. This was evidenced by mountains being incorporated in multiple sections of the First Global Stocktake of the Paris Agreement, and by the Expert Dialogue on Mountains and Climate Change hosted at the 60th Meeting of the Subsidiary Body for Scientific and Technological Advice (SBSTA 60) (UNFCCC, 2023; UNFCCC, 2024).

Looking ahead, projections on the impacts of climate change on mountains stress how the situation is expected to further deteriorate if no decisive action is taken. In particular, the Working Group II Report of the IPCC's Sixth Assessment Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (Adler *et al.*, 2022) reports that throughout the twenty-first century, rising temperatures will persist and will continue to negatively affect mountainous areas, resulting in anticipated adverse impacts on the mountain cryosphere, biodiversity, ecosystem services and human welfare.

Projections indicate that climate change will lead to significant and irreversible transformations in mountain regions, with adverse effects on cultural identity and traditional ways of life. The present pace and extent of adaptation efforts in mountainous regions fall short of addressing both current and impending climate change challenges (Adler *et al.*, 2022). To reverse current trends, more radical and transformative approaches are necessary. As global temperatures surpass the 1.5 °C threshold, the need for adaptation to address key risks in mountainous terrains intensifies, demanding immediate action.

BOX 2: THE LINK BETWEEN CLIMATE CHANGE AND HUMAN MOBILITY

The impacts of climate change on mountains are already clearly visible in several different regions of the world. For example, in the Hindu Kush Himalaya, climate change is driving shifts in cultivation practices and leading to significant outmigration phenomena due to reduced land productivity. In the past few years, recurrent droughts in Nepal have rendered vast tracts of land unsuitable for farming, prompting migration to urban centres for livelihood diversification and income security. These narratives underscore the intricate relationship between climate impacts and human mobility, necessitating nuanced adaptation strategies (ICIMOD and HIMAP, 2019).

Similar scenarios are forecast in other mountain areas, such as those in Eastern Africa. For example, in the Jimma area (Ethiopia highlands), increasing temperatures are predicted to negatively impact traditional coffee production, resulting in the loss of coffee-forest canopies and a reduction in forest-dependent biodiversity, negatively affecting local livelihoods (Capitani *et al.*, 2019).

While the Peruvian Andes are home to more than 70 percent of the world's tropical glaciers, glacier surface in the country is estimated to have diminished by at least 40 percent since the mid-century, impacting a crucial source of water supply. Along with other critical climate hazards, glacier retreat influences livelihoods and impacts human mobility patterns (Bergmann et *al.*, 2021).

2. Human mobility patterns in climate change contexts

Human mobility, especially pastoralism and labour migration, is a historical social feature of mountain societies, notably related to the need to access production zones situated at various altitudes. However, increasingly critical climate hazards are disrupting historical patterns and affecting multiple dimensions of human mobility (Hock *et al.*, 2019). Growing evidence is available on the impacts of climate change on human mobility in mountain areas, especially where livelihoods are primarily dependent on ecosystem services (Adler *et al.*, 2022).

Within mountainous regions, climatic impacts indirectly influence human mobility by adversely affecting livelihoods that are reliant on ecosystem services provided by mountains. In certain instances, climate-induced hazards prompt outmigration from mountainous regions, thereby indirectly impeding labour availability required to sustain agricultural practices and productivity within these areas and therefore negatively impacting local economies (Adler *et al.*, 2022).

Sudden-onset hazards – both specific and non-specific to mountain areas – have the distinct impact of displacing people from their homes. Disasters provoked by avalanches, floods, glacial lake outburst floods, landslides and mudflows have been reported to lead to displacements in mountain areas around the world (Adler *et al.*, 2022). The Kedarnath flood disaster in 2013, in Northern India, led to a total of 75 000 displacements, according to the Dartmouth Flood Observatory (Stäubli *et al.*, 2018). Between 2008 and 2021, earthquakes, landslides and floods resulted in 15 100 displacements in Kyrgyzstan and 41 000 in Tajikistan (IDMC, 2022). Planned evacuation processes can help to reduce loss and damage. However, mountain ecosystems present specific challenges in this regard. Analyses of disaster impacts in Northern Patagonia have shed light on the specific challenges of affected mountain regions in terms of isolation and barriers to transportation due to snowstorms and rock fall blocking roads, which tends to complicate processes of evacuation. Evacuations by water in these cases are often impeded by a range of difficulties, including limited knowledge of the vulnerability of water networks (Salgado *et al.*, 2022).

Pastoralism remains a traditional livelihood strategy in different mountain areas worldwide, especially in high mountain areas (Adler *et al.*, 2022), but is declining due both to climatic factors (including changes in snow

Ecuador highlands.
© Terra Sur Travels, 2022, on Unsplash.

distribution and glaciers) and non-climatic factors (Hock *et al.*, 2019). The Working Group II Report of the IPCC's Sixth Assessment recognizes human mobility as a potentially viable climate change adaptation strategy for poor pastoralists. The report also highlights that pastoralism is restricted due to the political marginalization of pastoral groups, land privatization, governments' decentralization policies, and plantation investments (Cissé *et al.*, 2022). Pastoralism is projected to continue to decline, at least in the short term (Hock *et al.*, 2019).

Labour migration in mountain areas can also enhance adaptation as it contributes to livelihood diversification, improves access to information and resources, and expands social networks (Adler *et al.*, 2022). This highlights the historical relevance of labour migration as a feature of mountain societies, its contribution to the well-being of the mountain people, and the need to counterbalance negative perceptions of migration. In 2023, the inflow of international remittances to Tajikistan amounted to 38.4 percent of gross domestic product (World Bank, 2024). Remittances help recipient households to access food, water and healthcare in the aftermath of disasters or during the lean season. However, leverage of financial and social remittances in planned adaptation measures in mountain communities remains limited.

Planned relocations may be an option of last resort for communities that are increasingly exposed to climatic hazards and where settlements are becoming, or have already become, permanently uninhabitable due to the impacts of climatic hazards. High emissions/

low development scenarios are likely to raise the potential to increase the need for planned relocations for people who are exposed to climate extremes but lack the means to move (Cissé *et al*., 2022). There are reports of relocations in mountain areas of Mexico, Nepal and Pakistan, (Adler *et al*., 2022) and China (Chen *et al*., 2021).

Place attachment appears to be one of the main drivers of immobility in mountain areas, even in cases where populations are confronted with environmental hazards and the impacts of climate change (Adler *et al*., 2022). In Tajikistan's Pamir mountains, the strong place attachment of local populations "influences immobility aspirations, short-distance displacements, and return after international out-migration" in an area characterized by severe environmental risk (Blondin, 2021). Place attachment and lifestyle option frameworks have also been explored to understand the staying aspirations of international migrants residing in mountain communities of Norway (Lynnebakke, 2021).

Low-agency migration[1] can also lead to increased exposure to natural hazards by concentrating vulnerable populations in high-risk areas. Hewitt and Mehta (2012) report that vulnerable segments of populations, including migrant workers and internally displaced persons, are most likely to live in more dangerous and least well-protected places, and they also have limited input to influence public safety measures.

These movements have strong gender implications. Human mobility frequently exhibits gendered patterns, with men often outmigrating, leaving women to manage households in their absence. Women's capabilities are frequently restricted by institutional barriers and societal norms, resulting in diminished adaptive capacities and heightened susceptibility to natural hazards and climate-induced disasters (Adler *et al*., 2022). Studies in the Kaligandaki Basin of Nepal have shown, for instance, that male outmigration entails an additional burden for women staying behind and that remittances do not always translate into increased women's control over household assets and community participation (Pandey, 2021). Enhancing autonomous adaptation measures by building the capacities of women staying behind in mountain areas has been found to positively influence households to make precautionary savings and invest in disaster preparedness measures (Banerjee *et al*., 2019).

1 While the term does not have an official definition, low-agency migration refers to movements where migrants lack relevant resources, input or participation to make voluntary choices, thus deriving in more forced type of movements. Low-agency migration can be derived from "low migrant financial resources, or limited participation in migration planning" and be "commonly associated with unsuccessful outcomes" (Mycoo *et al.,* 2022). In certain contexts, "low-agency migration is often a product of adverse political, economic, or social conditions in the origin country, and may be costly and detrimental for migrants and destination countries alike" (McLeman, 2020).

3. Initial evidence from Ecuador, Kyrgyzstan and Tajikistan

An Assessment of Migration, Environment, and Climate Change Nexus in the Mountain Areas in Central Asia and Latin America is being undertaken by the International Organization for Migration[2] and its partners.[3] This assessment aims to explore the impacts of environmental and climate factors on various types of human mobility, as well as the consequences of human mobility on the vulnerability of mountain households. Baseline data collection was carried out in Ecuador and Kyrgyzstan in 2023, and in Kazakhstan, Tajikistan and Uzbekistan in 2024.

This assessment adopts a longitudinal study design – an approach that entails the repeated observations of variables over a period of time. The quantitative data will be collected annually to help better understand trends and causal linkages. The initiative has also adopted a two-stage systematic sampling approach. The survey collects household-level information related to demographic characteristics, exposure to climatic and environmental hazards and their impacts, household responses to climatic and environmental hazards, access to water, food security, financial inclusion and livelihoods, and human mobility types and consequences. The survey instrument was developed in collaboration with international and national research partners and incorporates feedback from multiple sectoral ministries in the project countries.

This section presents some preliminary baseline findings from Kyrgyzstan, Tajikistan and Ecuador. A total of 1 991 households were surveyed in Kyrgyzstan during the first wave of the survey. These households were surveyed in three regions – Jalal-Abad, Osh and Batken. A total of 1 647 households were surveyed in Tajikistan during the first wave of the survey. These households were interviewed from four regions – Districts of Republican Subordination (DRS), Gorno-Badakhshan Autonomous Province (GBAO), Sughd and Khatlon regions. In Ecuador, a baseline survey was applied to 1 184 households from three communities: Machachi, Mulalillo and Guaranda, located in the provinces of Pichincha, Cotopaxi and Guaranda, respectively.

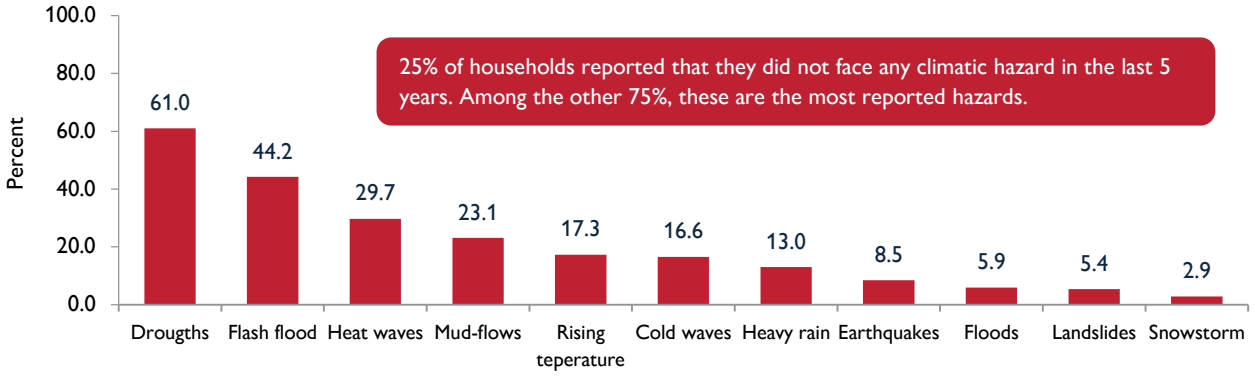
2 The research is funded by the U.S. Department of State Bureau of Population, Refugees and Migration and the IOM Development Fund.

3 Population Council Consulting, globally, Instituto de Altos Estudios Nacionales in Ecuador, the Association of Environmental Organizations of Kazakhstan (AEOK) in Kazakhstan, the Pikir Izildoo Laboratoriyasy Pvt. Ltd in Kyrgyzstan, the Z-Analytics in Tajikistan, and the Hydrometeorological Research Institute in Uzbekistan.

Exposure to climatic and environmental hazards

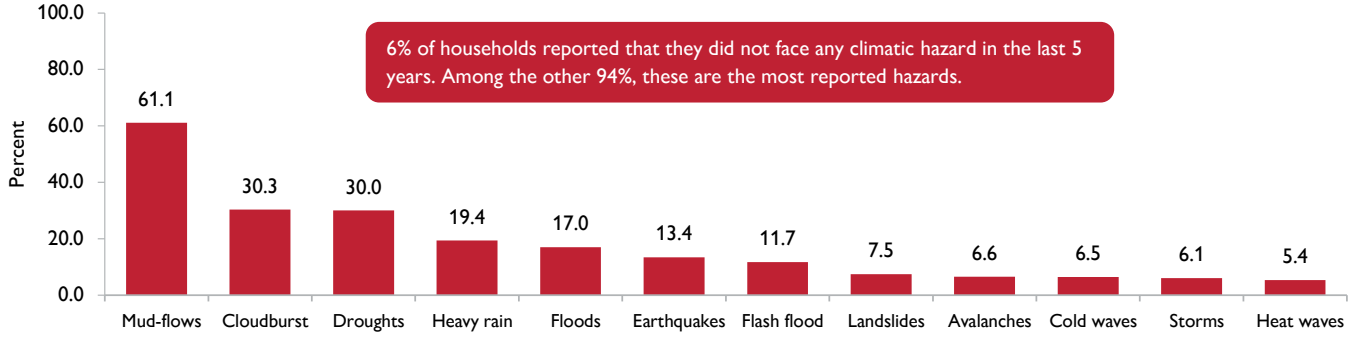
The baseline findings from the study communities in Kyrgyzstan indicate that mountain communities are experiencing rising temperatures, hotter summers, longer summers, a decrease in seasonal rainfall, delayed rainfall, and a decline in the number of rain days. They also report experiencing sudden-onset hazards (such as earthquakes, flash floods, floods and mudflows) and slow-onset hazards (such as droughts and heatwaves). The baseline findings from Tajikistan indicate that mountain communities are experiencing similar changes. The study communities in Ecuador mainly experienced rising temperatures and slow-onset hazards, such as droughts, frost, cold waves and heatwaves.

Figure 4: Types of environmental and climatic hazard faced by people in past 5 years, Kyrgyzstan



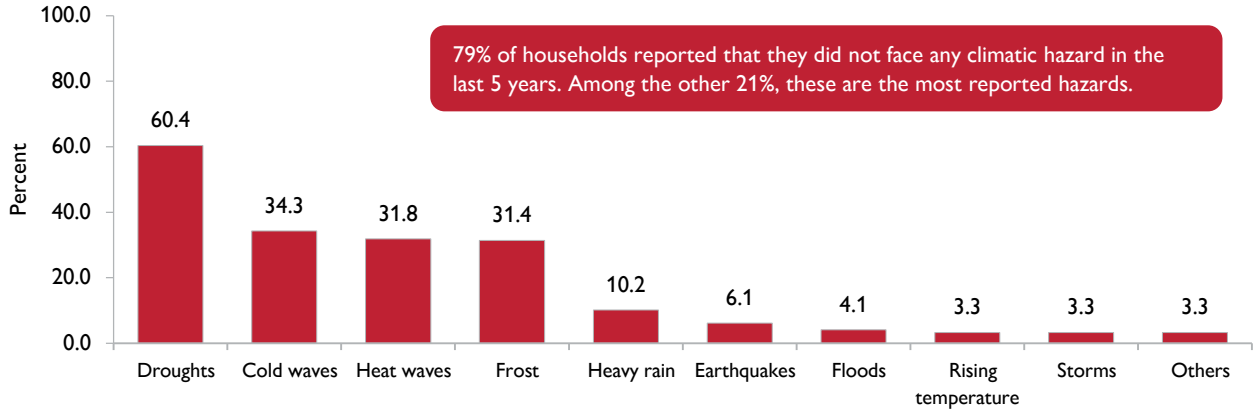
Source: Authors' own compilation.

Figure 5: Types of environmental and climatic hazard faced by people in past 5 years, Tajikistan



Source: Authors' own compilation.

Figure 6: Types of environmental and climatic hazard faced by people in past 5 years, Ecuador



Source: Authors' own compilation.

Impacts of climatic and environmental hazards

These climatic and environmental hazards had a diverse range of impacts on households, including, in the cases of Kyrgyzstan and Tajikistan, psychological discomfort, damage to farmland, damage to pasture, shortage of safe drinking water, loss of crops, damage to houses, loss of income, and reduction in water available for farming. In the study communities in Ecuador, the hazards damaged houses and farmland and resulted in the loss of crops and income, as well as a shortage of food.

Household responses to climatic and environmental hazards

In situ responses

There are multiple ways in which the mountain households responded to the impacts of climatic and environmental hazards. In Kyrgyzstan, the *in situ* responses included cleaning and repairing houses, making structural changes to them, constructing physical barriers around houses, household members seeking work in the same community, storing fodder, storing drinking water, and boiling/filtering drinking water. The respondent households in Kyrgyzstan also reported reducing spending on clothes and other consumer goods, food and education. In Tajikistan, in addition to responses that were similar to those observed in Kyrgyzstan, the respondent households also reported growing new crops, growing drought-tolerant and flood-resistant crops, selling household and agricultural assets, borrowing money, and reducing spending on healthcare. In the study communities in Ecuador,

in situ responses included cleaning and repairing houses, boiling/filtering drinking water, collecting fuelwood, using savings, and making changes to the farming calendar. Food security was a key issue in the study communities in the context of climatic and environmental hazards in Ecuador. Respondent households reported relying on less preferred foods, spending savings on food, and storing food items.

Ex situ responses

The impacts of climatic and environmental hazards are also shaping human mobility patterns – an ***ex situ*** response – in the study communities. The incidence of disaster displacement was relatively low in the study communities during the baseline period. Around one-seventh of the households in Tajikistan experienced displacement due to environmental or climatic hazards. Disaster displacement was not reported in the study communities in Ecuador and Kyrgyzstan. The findings from the study communities in Tajikistan offer some insights into the common challenges experienced by disaster displaced households. They reported challenges related to accommodation, shortage of safe drinking water, shortage of food, lack of transportation, lack of livelihoods, and the absence of financial support during displacement.

Climatic and environmental factors are influencing pastoralism in Central Asia. Around one-third of the households in Kyrgyzstan – that experienced environmental or climatic hazards in the five years preceding the baseline survey – reported a decline in the availability and quality of grazing lands; one-quarter had difficulty in accessing water for livestock, and one-third faced challenges in accessing fodder. Among these households, almost two-thirds reported conflicts with local stakeholders such as other pastoralists, local farmers and foresters in accessing pasture, and more than one-third reported conflict arising from accessing water. Similar changes in pastoralism were reported in Tajikistan. Around one-third of the households – that experienced environmental or climatic hazards in the five years preceding the baseline survey – reported a decline in the availability and quality of grazing lands; more than one-third had difficulty in accessing water for livestock, and two-fifths faced challenges in accessing fodder. Among these households, almost one-tenth reported conflicts with local stakeholders such as other pastoralists, local farmers and foresters. In both these countries, most of the community-level conflicts related to pastoralism were solved with the assistance of community leaders. In addition, the Pasture Users' Association played a key role in solving these conflicts in Kyrgyzstan.

Yaghnob Valley, Tajikistan.
© Joel Heard, 2021, on Unsplash.

Labour migration is a key household strategy during the lean season and to address the impacts of extreme events in mountain areas. In Kyrgyzstan, the average amount of remittances received by the total number of respondent households with internal migrant workers during the 12 months preceding the survey was USD 290 835. The average amount of remittances received by all households with international migrant workers during the 12 months preceding the survey was USD 244 617. However, most of the migrant workers from these respondent households did not have access to social security benefits. This indicates that they were employed in the informal sector in destination communities.

In Tajikistan, the average amount of remittances received by all households with internal migrant workers during the 12 months preceding the survey was USD 68 526. The average amount of remittances received by all households with international migrant workers during the 12 months preceding the survey was USD 47 428. As in Kyrgyzstan, most of these migrants

were employed in the informal sector in destination communities, as indicated by most of the migrant workers not having access to social security benefits. More than one-fifth of the respondent households in Tajikistan reported that migrant household members increased the amount of remittances in the aftermath of disasters. Remittances were spent on food, education, healthcare, accommodation and loan repayments.

A Livelihoods Vulnerability Index was constructed to better understand how human mobility is shaping household-level vulnerability to environmental and climatic hazards.[4] The households in the study sample were categorized based on low, medium and high adaptive capacity and sensitivity. In the study communities in Kyrgyzstan, more households with an international migrant family member had medium adaptive capacity and medium sensitivity than households with no migrants. In the study communities in Tajikistan, households with migrants had improved adaptive capacity (38 percent) compared with households with no migrants (29 percent). It should be noted that these findings were context-specific.

Migration – related to the impacts of climate change and to other factors, such as education – remains relatively limited in the study communities of Ecuador. Only 244 individuals in surveyed households (out of a total 3 394) reported having engaged in migration, of which 85 moved due to climate-related reasons and 159 for other reasons, not specifically related to climate hazards. However, issues surrounding immobility seemed to be quite prevalent in the study communities of Ecuador, with a large segment of households (197 out of a total of 1 184) reporting not being able to migrate despite being affected by climate hazards, and a higher proportion in this group made up of male-headed households with lower education levels.

4 Based on the Working Group II of the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

4. A future agenda: leveraging policies and opportunities

The initial evidence compiled by the IPCC and other sources, as well as the initial baseline findings of the IOM assessment, point to the need to pursue an ambitious agenda to address the impacts of climate and environmental change on human mobility in mountain areas. While this topic has been attracting increased attention in recent times, further efforts are required to address vulnerabilities and leverage the positive impacts of human mobility. In particular, the following areas of opportunity have emerged in the short and medium term:

- Advocacy efforts, especially within future UNFCCC COPs, should place a strong emphasis on human mobility in the context of climate change and highlight that mountain areas are at the forefront of the conversation, seeking the contributions of multiple parties to drive the agenda forward.
- Given the lack of data specifically addressing the link between climate change and human mobility in mountain areas in several geographies, additional research is required. This includes the continuation of the longitudinal assessment initiated by IOM in multiple countries, expanding these to new geographies, as well as the launch of new initiatives that address emerging topics related to human mobility in mountain areas, while acknowledging the diversity of mountain societies.
- Policymaking on climate change adaptation should better integrate human mobility in the context of climate change with a dedicated insight into mountain areas. Efforts have been deployed recently to integrate human mobility into relevant national planning processes, with significant success. However, these policies are often developed at the national level, with limited capacity to address the specific situation of mountain areas in many countries. Dedicated efforts are required to address the situation of mountain societies in relevant planning processes at national and subnational levels.
- Improving knowledge management and coordination of disaster risk management and displacement in mountain areas. Given the impacts of sudden-onset disasters in driving displacement in exposed mountain regions and the prevalence of specific hazards, such as glacial lake outburst floods, flash floods, mudflows and landslides, there is an opportunity to advance coordination and knowledge management in disaster risk management efforts, including the topics of planned evacuation and planned relocation, within regional groupings and in the wider global context.
- Creating pathways for safe and orderly migration – internal and international – not only has economic benefits, but if leveraged as part of planned adaptation programmes, could help migrants and their family members to contribute to and benefit from climate change adaptation.
- Reinforcing Indigenous Peoples' knowledge and practices with emerging technologies, securing rights to natural resources, improving institutional arrangements, and providing conflict resolution mechanisms to enhance the adaptation potential of pastoralism.

References

1. **Adler, C., Wester, P., Bhatt, I., Huggel, C., Insarov, G.E., Morecroft, M.D., Muccione ,V. & Prakash, A.** 2022. Cross-Chapter Paper 5: Mountains. In: H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem & B. Rama, eds. *Climate change 2022: Impacts, adaptation and vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK, Cambridge University Press and NY, USA, New York, pp. 2273–2318, doi:10.1017/9781009325844.022.

2. **Banerjee, S., Hussain, A., Tuladhar, S. & Mishra, A.** 2019. Building capacities of women for climate change adaptation: Insights from migrant-sending households in Nepal. *Climatic Change*, 157, 587–609,21. doi:10.1007/s10584-019-02572-w.

3. **Bergmann, J., Vinke, K., Fernández Palomino, C.A., Gornott, C., Gleixner, S., Laudien, R., Lobanova, A. Ludescher, J. & Schellnhuber, H.J.** 2021. *Assessing the evidence: Climate change and migration in Peru*. Potsdam, Germany, Potsdam Institute for Climate Impact Research (PIK) and Geneva, Switzerland, International Organization for Migration (IOM). https://publications.iom.int/system/files/pdf/assessing-the-evidence-peru.pdf.

4. **Blondin, S.** 2021. Staying despite disaster risks: Place attachment, voluntary immobility and adaptation in Tajikistan's Pamir Mountains. *Geoforum*, (126) 290–301. https://doi.org/10.1016/j.geoforum.2021.08.009.

5. **Blyth, S., Groombridge, B., Lysenko, I., Miles, L. & Newton, A.** 2002. *Mountain watch: Environmental change and sustainable development in mountains*. UNEP World Conservation Monitoring Centre. https://lib.icimod.org/record/11058.

6. **Capitani, C., Garedew, W., Mitiku, A., Berecha, G., Tesfau Hailu, B., Heiskanen, J. Hurskainen, P. *et al.*** 2019. Views from two mountains: Exploring climate change impacts on traditional farming communities of Eastern Africa highlands through participatory scenarios. *Sustain Sci,* 14: 191–203. https://doi.org/10.1007/s11625-018-0622-x.

7. **Cissé, G., R. McLeman, H. Adams, P. Aldunce, K. Bowen, D. Campbell-Lendrum, S. Clayton, K.L *et al.*** 2022. Health, Wellbeing, and the Changing Structure of Communities (Chapter 7). In: H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem & B. Rama, eds. *Climate change 2022: Impacts, adaptation and vulnerability.* Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 1041–1170. https://doi.org/10.1017/9781009325844.009.

8. **Chen, Y., Tan, Y. & Gruschke, A.** 2021a. Rural vulnerability, migration, and relocation in mountain areas of Western China: An overview of key issues and policy interventions. *Chinese Journal of Population, Resources and Environment*, 19(1): 110–116. https://doi.org/10.1016/j.cjpre.2021.12.012.

9. **Hewitt, K. &. Mehta, M**. 2012. Rethinking risk and disasters in mountain areas. *Revue de géographie alpine*, 100-1. http://rga.revues.org/1653. doi: 10.4000/rga.1653.

10. **Hock, R., Rasul, G., Adler, C., Cáceres, B., Gruber, S., Hirabayashi, Y., Jackson, M. *et al.*** 2019. High Mountain Areas. In: H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama & N.M. Weyer, eds. *IPCC Special report on the ocean and cryosphere in a changing climate.* Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 131–202. https://doi.org/10.1017/9781009157964.004.

11. **ICIMOD (International Centre for Integrated Mountain Development) & HIMAP (Hindu Kush Himalayan Monitoring and Assessment Programme).** 2019. *The Hindu Kush Himalaya Assessment: Mountains, climate change, sustainability and people*. Springer International Publishing. https://lib.icimod.org/record/34383.

12. **IDMC (Internal Displacement Monitoring Centre).** 2022. *Global report on internal displacement*. https://api.internal-displacement.org/sites/default/files/publications/documents/IDMC_GRID_2022_LR.pdf.

13. **IPCC.** 2019. Summary for Policymakers. In: H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama & N.M. Weyer, eds. *IPCC Special report on the ocean and cryosphere in a changing climate.* Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 3–35. https://doi.org/10.1017/9781009157964.001.

14. **Lynnebakke, B.** 2021**.** The role of place attachment and local lifestyle opportunities for labour migrants' staying aspirations in two Norwegian rural municipalities. **Migration Studies**, 9(3): 759–782. https://doi.org/10.1093/migration/mnaa002.

15. **McLeman, R.** 2020. How Will International Migration Policy and Sustainable Development Affect Future Climate-Related Migration? Migration Policy Institute. https://www.migrationpolicy.org/sites/default/files/publications/tcm-climate-migration-mcleman_final.pdf.

16. **Mycoo, M., Wairiu, M., Campbell, D. Duvat, V., Golbuu, Y., Maharaj, S., Nalau, J., Nunn, P., Pinnegar, J. & Warrick, O.** 2022. Cross-Chapter Paper 5: Small Islands. In: H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem & B. Rama, eds. *Climate change 2022: Impacts, adaptation and vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK, Cambridge University Press and NY, USA, New York, pp. 2273–2318, doi:10.1017/9781009325844.022.

17. **Pandey, R.** 2021. Male out-migration from the Himalaya: Implications in gender roles and household food (in) security in the Kaligandaki Basin, Nepal. *Migration and Development*, 10:3: 313–341. doi: 10.1080/21632324.2019.1634313.

18. **Romeo, R., Grita, F., Parisi, F. & Russo, L.** 2020. *Vulnerability of mountain peoples to food insecurity: Updated data and analysis of drivers*. Rome, FAO and UNCCD. https://openknowledge.fao.org/server/api/core/bitstreams/28c5d6ba-37d8-459f-99dc-232e9d5bef7f/content.

19. **Salgado, P.A., Villarosa, G., Beigt, D. & Outes, V.** 2022. Water evacuations in remote tourist regions: Evaluating case studies from natural hazards in North Patagonian lakes, Argentina. *J. Mt. Sci.*, 19: 1782–1807. https://doi.org/10.1007/s11629-021-7207-3.

20. **Stäubli, A., Nussbaumer, S. U., Allen, S. K., Huggel, C., Arguello, M., Costa, F. & Hergarten, C.** 2018. Analysis of Weather and Climate-related Disasters in Mountain Regions using Different Disaster Databases. In: S. Mal *et al.*, eds. *Climate change, extreme events and disaster risk reduction*, Sustainable Development Goals Series. https://doi.org/10.1007/978-3-319-56469-2_2.

21. **UNFCCC.** 2023. *First Global Stocktake*. FCCC/PA/CMA/2023/L.17. https://unfccc.int/sites/default/files/resource/cma2023_L17_adv.pdf.

22. **UNFCCC.** 2024. *Expert dialogue on mountains and climate change*.

23. https://unfccc.int/event/expert-dialogue-on-mountains-and-climate-change.

24. **World Bank.** 2024. Data on personal remittances. [Accessed on 3 August 2024]. https://data.worldbank.org/indicator/BX.TRF.PWKR.DT.GD.ZS.

Human Mobility in Mountain Areas in a Changing Climate

Please send enquiries to:

Mountain Partnership Secretariat

Email: info@mountainpartnership.org

International Organization for Migration

Email: cadhq@iom.int

Some rights reserved. This work is available under a CC BY-NC-SA 3.0 IGO licence.

© FAO and IOM, 2024

CD3006EN/1/11.24